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What IEEE/EIA 12207 and J-STD-016 Are, and How They Compare to the CMM® and ISO 9001

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...Good Company

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Objectives Tonight -- To Answer...

- **...What IEEE/EIA 12207, and J-STD-016 are**
- **...At a high level how IEEE/EIA 12207 and J-STD-016 compare to predecessor standards**
- **...How IEEE/EIA 12207 and J-STD-016 compare to the CMM® and to ISO 9001.**

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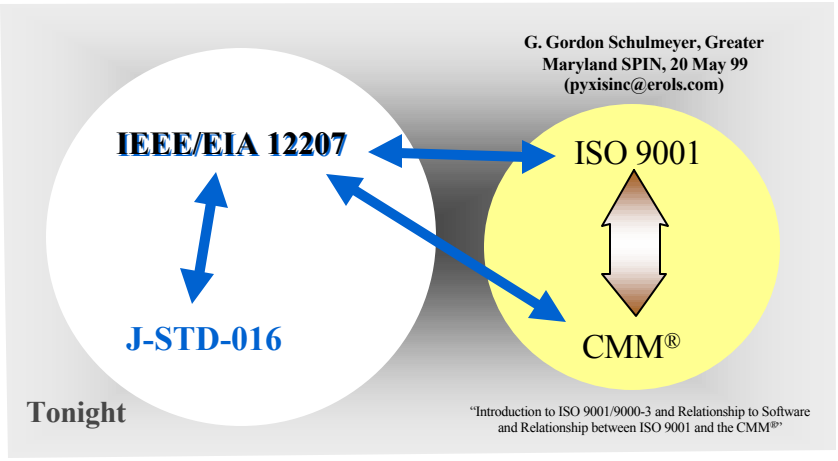
Complementary Information: Comparing the CMM® to ISO 9001



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Tonight...

- **Background**
- **Similarities and differences between requirements in**
  - IEEE/EIA 12207
  - ISO 12207
  - J-STD-016
  - MIL-STD-498
- **Comparing**
  - IEEE/EIA 12207
  - J-STD-016
  - CMM®
  - ISO 9001
- **More**

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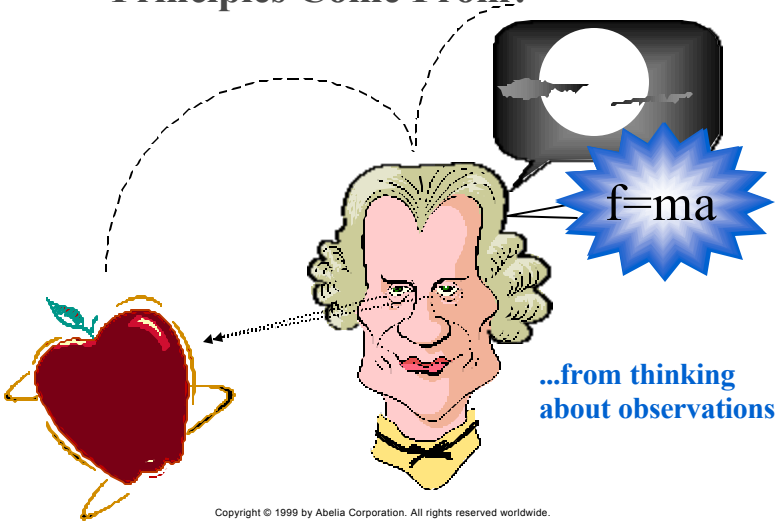
Background: Where Do Engineering Principles Come From?



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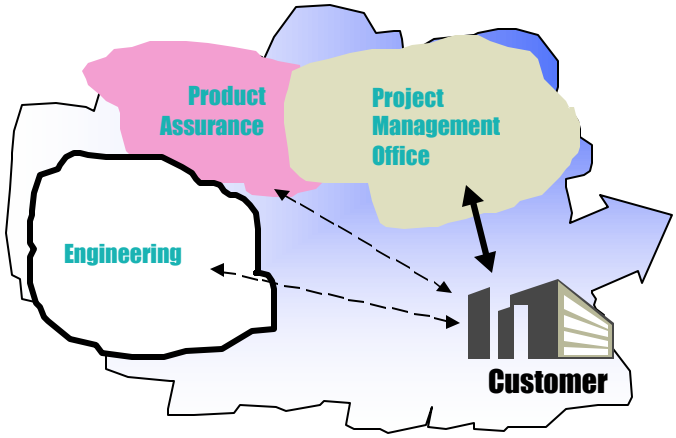
Software Process Principles Have Come From Large Software Projects



Principles are captured in software process standards

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Adaptation & Adoption

- **Example of adapting a process standard for a small project: the Personal Software Process (PSP) by Watts Humphrey adapts the CMM® to the detailed design, coding, and unit testing activities of a single person.**
- **Typically, other software process standards must be adapted to small projects also before the small projects adopt them -- however, paradigm examples have not yet been published.**
- **So, one point of comparison already, this need for adaptation to small projects is common to IEEE/EIA 12207, J-STD-016, the CMM®, and ISO 9001 -- and all four standards allow it!**

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Major Topics

Significant similarities and differences between requirements in

- IEEE/EIA 12207
- ISO 12207
- J-STD-016
- MIL-STD-498

- **High-level comparison of**
  - IEEE/EIA 12207
  - J-STD-016
  - CMM®
  - ISO 9001

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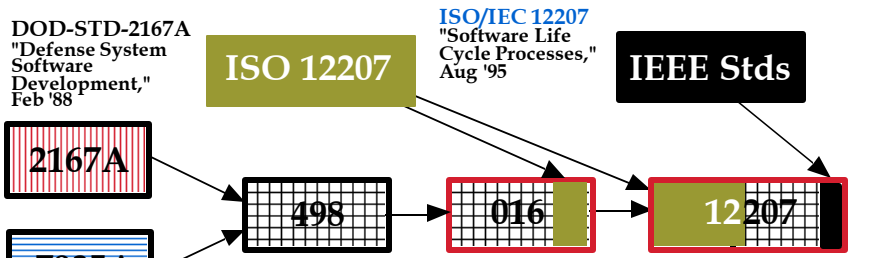
The Pedigree of IEEE/EIA 12207



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Traditions of Major Influences

- **U.S. Military Standards**
  - created by organizations within the U.S. Department of Defense
  - authored by industry contractors
  - authors guided by advisory committees consisting both of individuals and of representatives of military and industry organizations
  - reviewed by military and industry personnel
  - legally enforced on military software contractors
  - used to compensate for shortage of technically-trained government software buyers.
- **ISO Standards**
  - created by committees of national representatives
  - inspire national implementations
  - used voluntarily
  - used by businesses
  - used to simplify trade.
- **IEEE Software Standards**
  - created by committees of professional individuals
  - used voluntarily
  - used by businesses and individuals
  - used for self-improvement.

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Similar Leadership Influences

The Chair of the DoD Harmonization Working Group (HWG) that developed **MIL-STD-498**,

the Editor of **ISO/IEC 12207** during its development,

the IEEE Co-Chair of the Joint Industry Working Group on Software Development that developed **J-STD-016-1995**, and

the IEEE Co-Chair of the Joint Industrial Standard Working Group (JISWG) that developed **IEEE/EIA 12207.0-1996**

all were the same person, Dr. Raghu Singh (SPAWAR), who is now with the U.S. Federal Aviation Admin. in Washington, DC.

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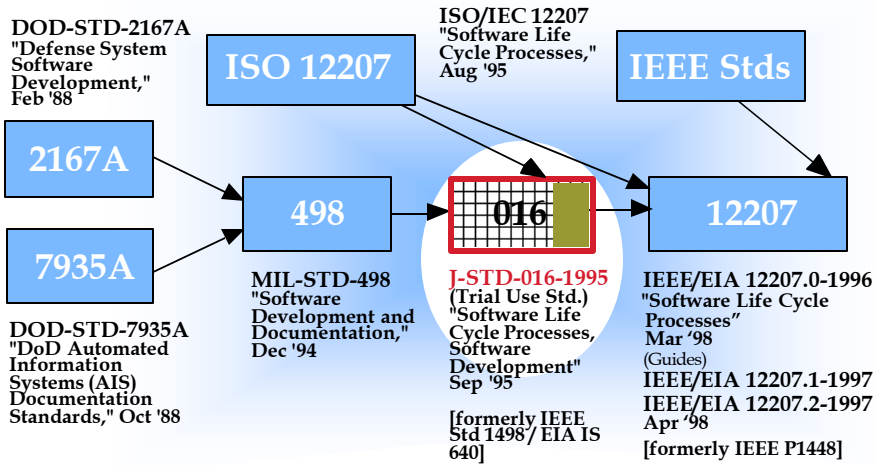
The U.S. Military Tradition: MIL-STD-498 to J-STD-016



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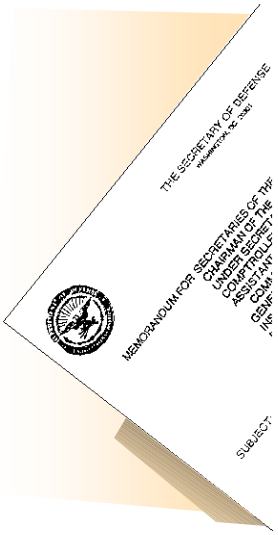
Why is There J-STD-016-1995?



- To bring MIL-STD-498's deliberately limited (2-year) life to a close.
- SecDef Perry's memo of 29 Jun 94 began the retirement of military software development standards.
- Despite the memo, MIL-STD-498 was adopted on 5 Dec 94 to provide a bridge to a suitable non-governmental software life cycle processes standard yet to be developed.
- That replacement standard is now called IEEE/EIA 12207. J-STD-016-1995 was the first step toward it.

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MIL-STD-498 vs. J-STD-016-1995 "Bottom Line"

- **J-STD-016 is a "demilitarized" MIL-STD-498.**
- **J-STD-016-1995 adds a general requirement for traceability similar to the traceability elements in MIL-STD-498 DIDs.**
- **For each detailed requirement in MIL-STD-498 there is one in J-STD-016-1995 with the same technical content.**
- **Two additional activities in J-STD-016-1995 update system and software requirements to match the "as-built" software.**
- **For each MIL-STD-498 DID there is a product description in J-STD-016-1995 with the same content.**
- **Every data item in J-STD-016-1995 is also in MIL-STD-498.**

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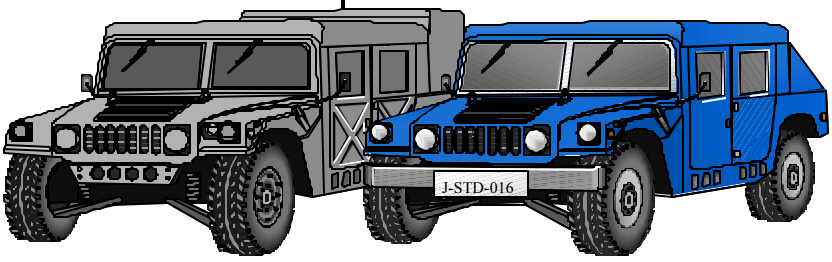
Only Cosmetic Differences

If this is MIL-STD-498...

...this is J-STD-016-1995



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Roles Directed by J-STD-016

- **Acquirer**
  - Procures software products for itself or another organization
  - Decides requirements for software products
  - Tailors J-STD-016
  - Confirms that software products satisfy requirements.
- **Developer**
  - **Establishes software process**
  - **Defines requirements and develops software products**
  - **Suggests tailoring of J-STD-016**
  - **Selects characteristics of software products to satisfy requirements**
  - **Performs other activities in J-STD-016 (that are not tailored out), develops and records data in J-STD-016 product descriptions (that are not tailored out).**
- **Maintenance Organization**
  - Performs the activities that that ensure that software installed for operational use continues to perform as intended and fulfill its intended role in system operation.

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J-STD-016 Acquirer-Developer Relation

- **Begins after contract award**
- **Developer requirements analysts go to work to find out what the acquirer's conditions for acceptance will be.**
- **Developer performs the activities in J-STD-016 that were not tailored out by the acquirer, and develops and records the data in the J-STD-016 product descriptions that were not tailored out by the acquirer.**
- **Periodically, developer presents status of work to acquirer.**
- **After reviewing developer's qualification tests, acquirer decides whether to accept software products.**

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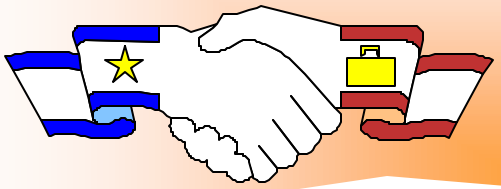
The Biggest Problems for Software Development Projects Occur Outside the Scope of J-STD-016

- **Contract terms (cost and schedule)**
- **Requirements**



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The Development of J-STD-016

- *Dropped military references*
- *Adopted ISO-style clauses*
- *Packaged data descriptions as subclauses*

Ballot in June '98 -
2nd ballot in Summer '99

- *Backed away from contractual use*
- *Redefined Tailoring*
- *Assumed defined organizational software process*

MIL-STD-498 "Software Development and Documentation," Dec '94

J-STD-016-1995 (Trial Use Std.) Sep '95

J-STD-016-1998 "Software Life Cycle Processes: Software Development"

Two Trends

- Compatibility with ISO standards
- Influence of software process improvement goals

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Should (and Will) J-STD-016 Survive?

YES, because...

- J-STD-016 product descriptions have been cited by IEEE/EIA 12207.1 but not included in whole.
- Projects that use (or prefer to adopt) MIL-STD-498 language for contracts, or have process descriptions based on it, need J-STD-016.

NO, because...

- Most of the J-STD-016 engineering requirements are already in IEEE/EIA 12207.2, and the content of J-STD-016 product descriptions could be added to IEEE/EIA 12207.1.
- IEEE/EIA 12207 is compatible with a software process description written in language from MIL-STD-498.
- Most topics in J-STD-016 are covered by other IEEE or ISO standards.

FACT...

- There is significant DoD interest in adopting J-STD-016.

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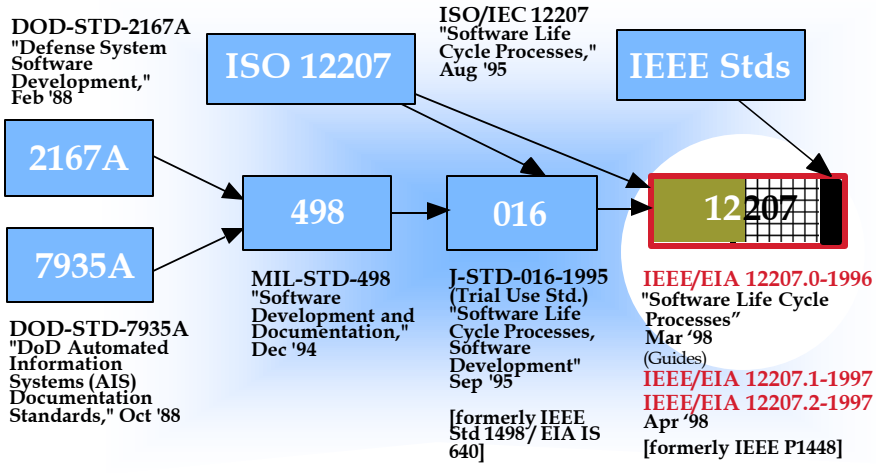
The Business Tradition: IEEE/EIA 12207



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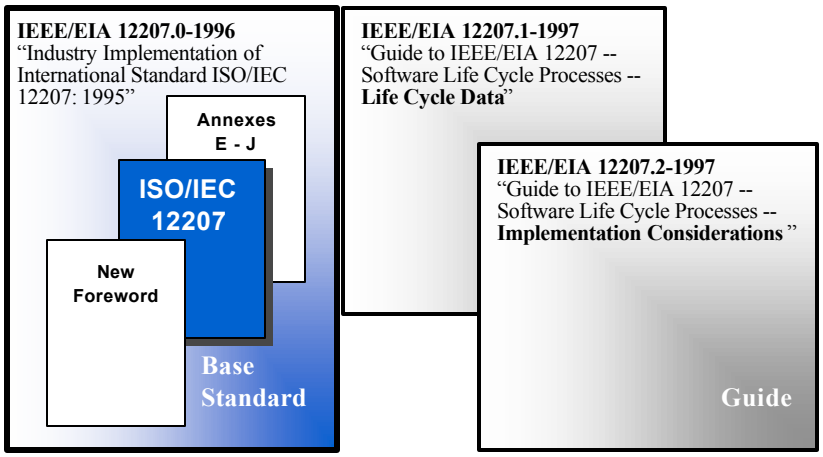
IEEE/EIA 12207 Structure at a Glance



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IEEE/EIA 12207 and Earlier Standards

- **IEEE/EIA 12207 adds guidance on data and on implementing life cycle processes to the requirements in ISO/IEC 12207.**
- **The content of ISO/IEC 12207 is preserved nearly intact in IEEE/EIA 12207 (tailoring and compliance are the major exceptions).**
- **Because the guidance in IEEE/EIA 12207 is based on the requirements in MIL-STD-498 / J-STD-016-1995, it allows contractual language and software processes and data based on the earlier standards.**
- **So, you can keep successful, old software processes and data requirements when adopting IEEE/EIA 12207.**

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How Does IEEE/EIA 12207 Differ From ISO/IEC 12207? "Bottom Line"

- **IEEE/EIA 12207.1 provides much more extensive guidance than ISO/IEC 12207 does on**
  - the possible content of key document types mentioned in ISO/IEC 12207 (for example 'description' and 'plan'), and on different instances of each type (for example database design description and project management plan).
- **IEEE/EIA 12207.2 provides guidance on (i.e., intends to "summarize the best practices" for)**
  - implementing the primary, supporting, and organizational life cycle processes defined in clauses 5, 6, and 7 of ISO/IEC 12207.
- **Tailoring is defined differently in IEEE/EIA 12207**
- **Compliance is defined differently in IEEE/EIA 12207**

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ISO/IEC 12207 & IEEE/EIA 12207 Distinguish Projects from Organizations

- **A project is a temporary, organized effort that develops products or processes or plans for, or provides services to, a customer.**

(This distinction is common to IEEE/EIA 12207 and the CMM)

- **Organizations establish and support projects to do such work. They dissolve a project when its work is finished.**
- **Organizations persist over long periods of time relative to projects -- project lives are determined by their parent organizations.**
- The IEEE/EIA 12207 model is that software is developed by projects that carry out their parent organization's agreements with acquirer customers.
- **A customer may be internal within the organization, or external.**

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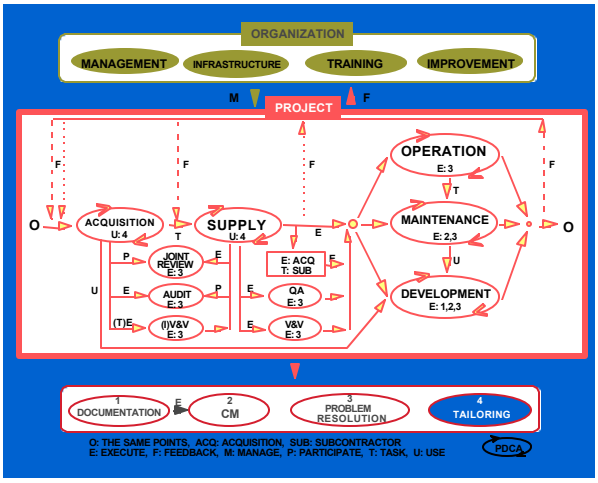
ISO/IEC 12207 & IEEE/EIA 12207
Share a Life Cycle Processes Model



Key

0	- the same points
CM	- Configuration Management process
E	- execute
E:n	- execute supporting process n
E:ACQ	- execute the Acquisition process
F	- feed back *(verb)*
(I)V&V	- (independent) Verification & Validation processes
M	- manage
P	- participate in
QA	- Quality Assurance process
T	- task *(verb)*
T:SUB	- task a subcontractor
(T)E	- task the processes if they are independent, or execute them otherwise
U	- use
U:n	- use supporting process n
PDCA	- Plan, Do, Check, Act

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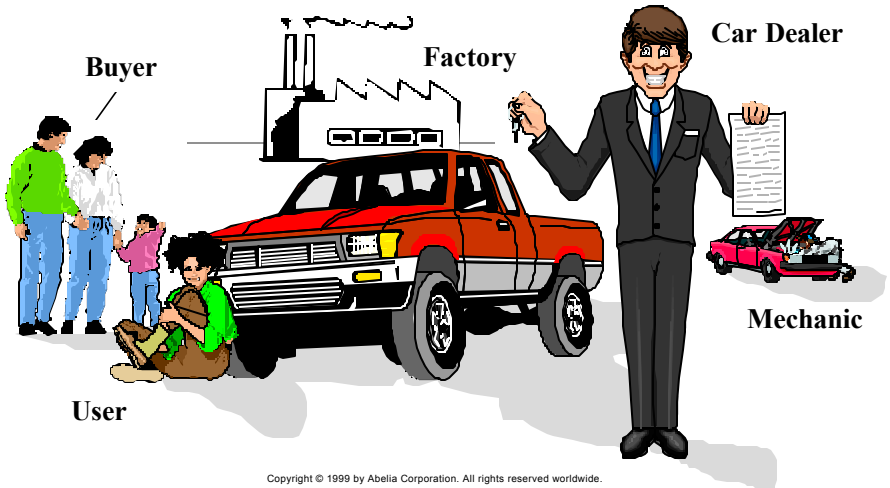
The life cycle processes of ISO/IEC 12207...

Retail Purchase Roles: A New Car



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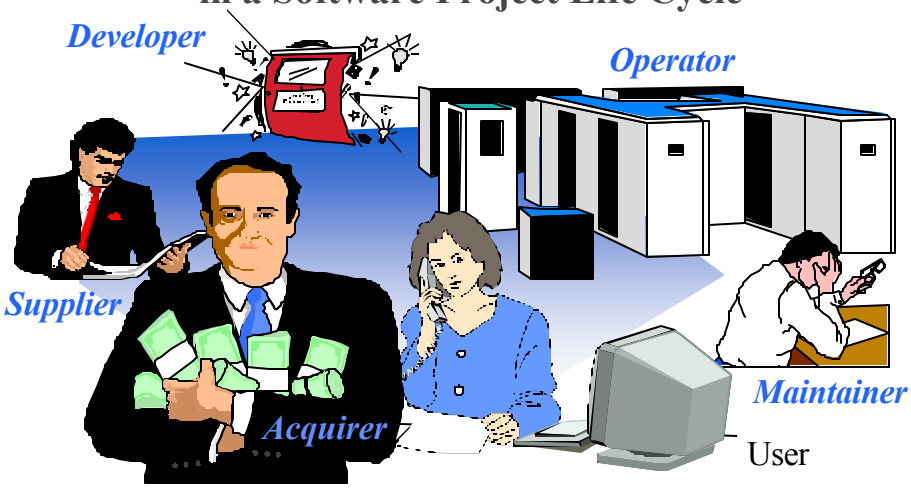
ISO/IEC 12207 & IEEE/EIA 12207...

Generalized Primary Parties in a Software Project Life Cycle



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ISO/IEC 12207 & IEEE/EIA 12207...

Basic Relation Between Primary Parties: a Binding Agreement

Example contracts: acquirer - supplier (5.1.3.4 - 5.2.3.1), supplier - subcontractor (5.2.5.4)

"3.7 Contract: A binding agreement between two parties, especially enforceable by law, or a similar internal agreement wholly within an organization, for the supply of software service or for the supply, development, production, operation, or maintenance of a software product."

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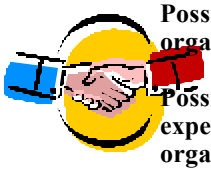
How are ISO/IEC 12207 and IEEE/EIA 12207 Used?



- **By two "parties" ---**

Possible Jointly: For legal, contractual language when one organization acquires software from another.

Possible Jointly: For "binding" guidance that establishes expectations between developers and their customers within an organization (for example, between two different projects, or between software programmers and software users).

Important Individually: As a checklist for evaluating the other party's plans and performance.

- **By a single "party" ---**

Most important: As a planning checklist for the party's role!

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ISO/IEC 12207 & IEEE/EIA 12207 are About the Software Life Cycle

A "Carnot cycle" for software development and operational use.

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In Contrast... MIL-STD-498 and J-STD-016 are About What Developers Do...

- **Twenty five management and engineering activities: some of these must be chosen (via tailoring) and ordered into a software development process, and then carried out as planned.**
- **Twenty two descriptions of data items (DIDs / product descriptions) that represent records of the results of the chosen management and engineering activities: some of the data elements of the data items must be chosen (via tailoring) and the chosen data must be recorded during software development.**

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...But, a Developer is Only One of Five Primary Parties in ISO/IEC 12207 & IEEE/EIA 12207

ISO/IEC 12207 and IEEE/EIA 12207 contain management, engineering, and data requirements for

- **Acquirers**
- **Suppliers**
- **Developers**
- **Operators, and**
- **Maintainers.**

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IEEE/EIA 12207
Acquirer-Developer Relation

- **Begins before contract award**
- **Acquirer's requirements analysts decide what the requirements will be before a developer is hired.**
- **Developer performs the activities in IEEE/EIA 12207 that were not tailored out by the acquirer, and develops and records the data required by the standard that were not tailored out by the acquirer.**
- **Periodically, developer presents status of work to acquirer.**
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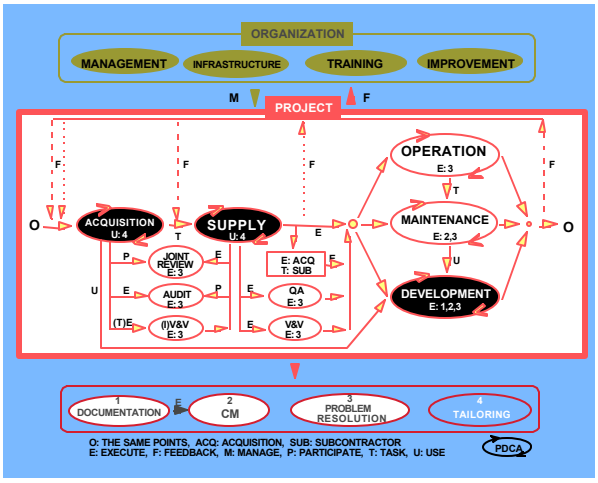
IEEE/EIA 12207
Life Cycle Processes Model



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PDCA	- Plan, Do, Check, Act

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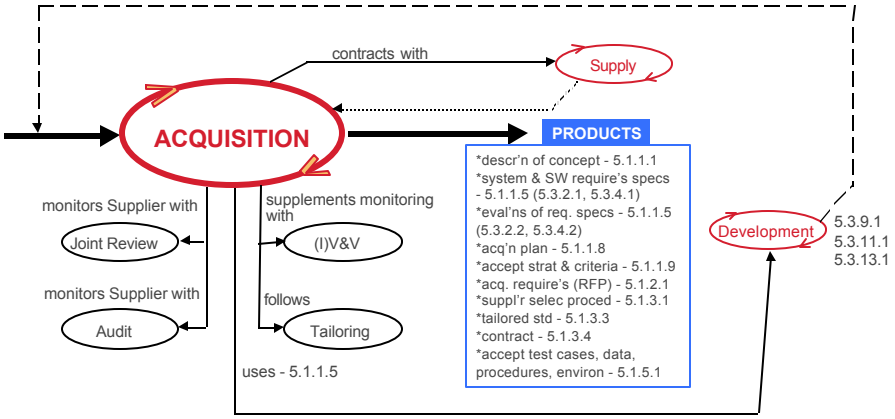
IEEE/EIA 12207 Acquisition Process



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Related IEEE/EIA 12207.1 Acquisition References

- **Concept of operations description (5.1.1.1) [2 refs] - J-STD-016 F.2.1 "Operational Concept Description"**
- **System requirements description (5.1.1.2) [4 refs] - J-STD-016 F.2.2 "System/Subsystem Specification"**
- **Software requirements description (5.1.1.4) [4 refs] - J-STD-016 F.2.3, F.2.4 "Interface Requirements Specification," and "Software Requirements Specification"**
- **Acquisition Plan (5.1.1.8) [3 refs] - ASTM E731 "Guide for Selection and Acquisition of Commercially Available Computerized Systems," IEEE Std 1062 "IEEE Recommended Practice for Software Acquisition"**
- **Test or validation procedures (5.1.5.1) [3 refs] - IEEE Std 829 "IEEE Standard for Software Test Documentation," J-STD-016 H.2.1 "Software Test Description"**

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Other Acquisition Process Data

- Request For Proposal (5.1.2.1)
- Contract (5.1.3.4)

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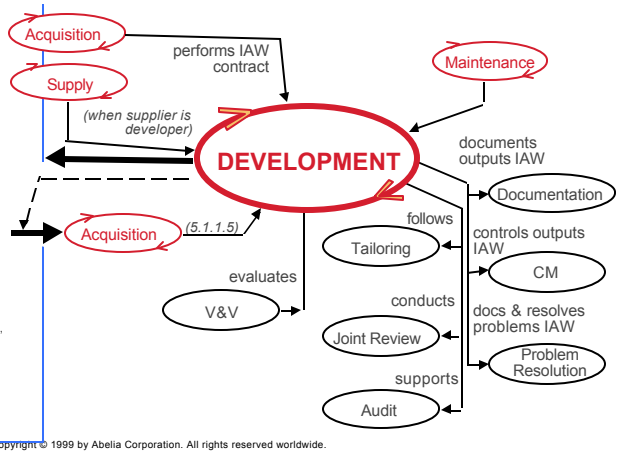
IEEE/EIA 12207 Development Process

*SW life cycle model w activs from Develop proc - 5.3.1.1
*baselines for config items - 5.3.1.2 (Annex J)
*tailored stds, methods, tools, langs - 5.3.1.3
*plans for activs of Develop proc - 5.3.1.4
*(sys require's spec - 5.3.2.1, in Acq. process)
*top-level sys architec - 5.3.3.1
*SW require's spec - 5.3.4.1 (in Acq. process also)
*architec of SW items - 5.3.5.1
*top-level design for interfaces - 5.3.5.2
*top-level design for databases - 5.3.5.3
*prelim & updated versions of user docs - 5.3.5.4, 5.3.6.4, 5.3.7.3, 5.3.8.3
*prelim & updated test require's and sched for SW integration - 5.3.5.5, 5.3.6.6, 5.3.7.4
*detailed design of SW comp's - 5.3.6.1
*detailed design of interfaces - 5.3.6.2
*detailed design of databases - 5.3.6.3
*require's & sched for testing SW units 5.3.6.5
*SW units & databases - 5.3.7.1
*SW unit test results - 5.3.7.2
*integration plan - 5.3.8.1
*sys & SW integ and test results - 5.3.8.2, 5.3.10.1
*tests, test cases & procedures for SW & sys qual testing - 5.3.8.4, 5.3.10.2
*SW & sys test results - 5.3.9.1, 5.3.11.1
*audit results - 5.3.9.4, 5.11.3
*evaln's of products - 5.3.2.2, 5.3.3.2, 5.3.4.2, 5.3.5.6, 5.3.6.7, 5.3.7.5, 5.3.8.5, 5.3.9.3, 5.3.10.3, 5.3.11.2
*complete deliverable SW product - 5.3.11.4, 5.3.13.2
*installation plan - 5.3.12.1
*installation events & results - 5.3.12.2
*acceptance review and testing results - 5.3.13.1

PRODUCTS



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Related IEEE/EIA 12207.1 Development References

- **Software life cycle model description (5.3.1.1) [1 ref] - IEEE Std 1074 "IEEE Standard for Developing Software Life Cycle Processes"**
- **System requirements specification (5.3.2.1) [4 refs] - J-STD-016 F.2.2 "System/Subsystem Specification"**
- **System architecture and requirements allocation description (5.3.3.1) [4 refs] - J-STD-016 G.2.1 "System/Subsystem Design Description"**
- **Software requirements description (5.3.4.1) [4 refs] - J-STD-016 F.2.3, F.2.4 "Interface Requirements Specification," and "Software Requirements Specification"**

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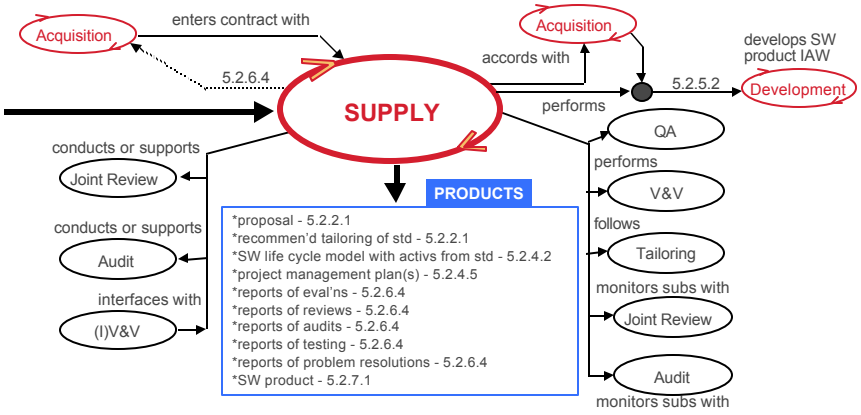
IEEE/EIA 12207 Supply Process



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Relevant Supply Process Data

- **Proposal (5.2.2.1)**

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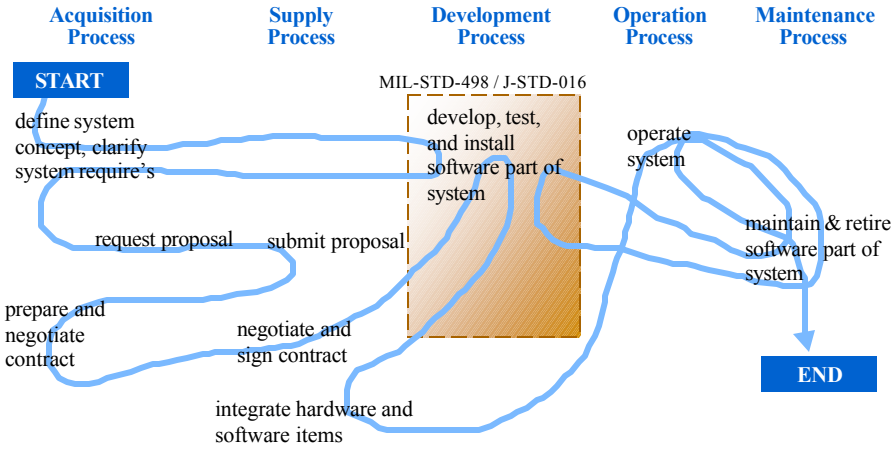
ISO/IEC 12207 & IEEE/EIA 12207...
Simple Life Cycle Activities Flow



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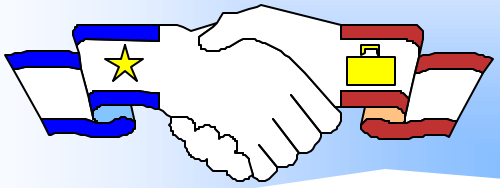
Back to the Biggest Problems for Software Development Projects...

- Contract terms (cost and schedule)
- Requirements
- They are within the scope of ISO/IEC 12207 and IEEE/EIA 12207.



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What is the Value of IEEE/EIA 12207?

- Covers more of the software life cycle, more thoroughly, than any earlier software process standard.
- Defines relations between the primary parties in the software life cycle better than any other standard except ISO/IEC 12207.

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Major Topics

- Significant similarities and differences between requirements in
  - IEEE/EIA 12207
  - ISO 12207
  - J-STD-016
  - MIL-STD-498

High-level comparison of

- IEEE/EIA 12207
- J-STD-016
- CMM®
- ISO 9001

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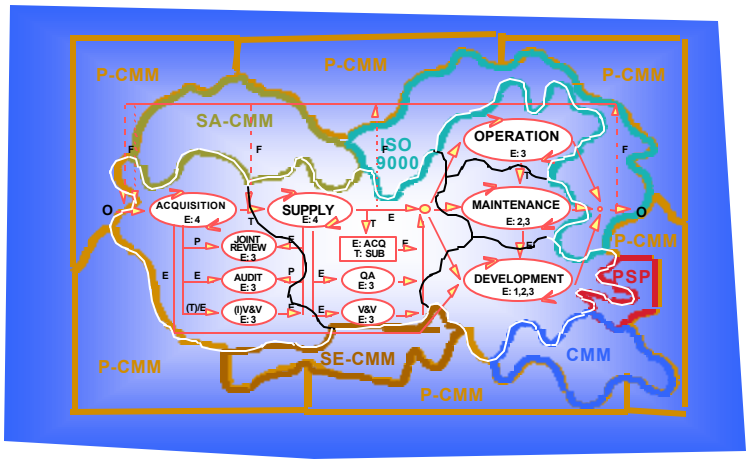
IEEE/EIA 12207, the CMM® and ISO 9000



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Bottom Line on IEEE/EIA 12207

17 life cycle processes + tailoring

Collected into 3 categories + tailoring.

A total of 78 activities.

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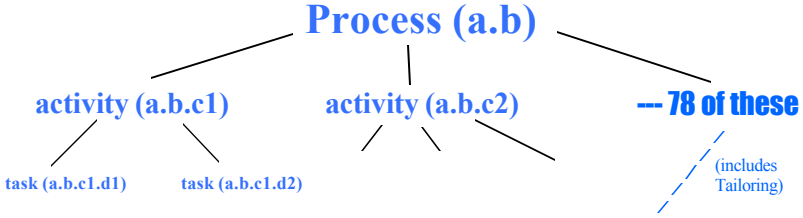
What is a Process in IEEE/EIA 12207?

"4.1.1 Life Cycle Processes

This International Standard groups the activities that may be performed during the life cycle of software into five primary processes, eight supporting processes, and four organizational processes. Each life cycle process is divided into a set of activities; each activity is further divided into a set of tasks. Subclause numbering a.b denotes a process, a.b.c an activity, and a.b.c.d a task..."



For the Tailoring process: (A.b) is a tailoring activity, (A.b.c) is a tailoring task.

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IEEE/EIA 12207 is Most Useful...

Define Concept

Request for Proposal (RFP)

Software Change Request (SCR)

Planning

funding obtained

initial response

etc.
etc.

Develop & Maintain

Require's Definition

Design

Implement

Test

Operate

IEEE/EIA 12207
suggests processes, data

What: WBS (contracted tasks, data)
Who: people
When: schedule
How: tasks, data, methods, procedures, tools

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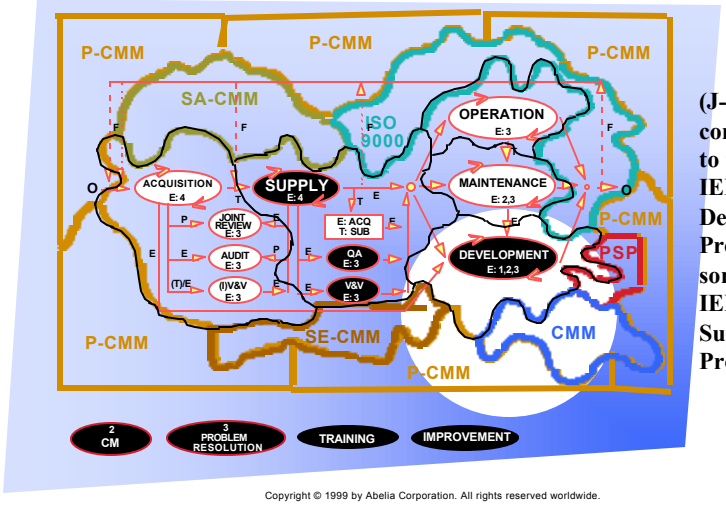
IEEE/EIA 12207 and the CMM®



(J-STD-016 corresponds to the IEEE/EIA 12207 Development Process -- plus some of the IEEE/EIA 12207 Supporting Processes)

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Bottom Line on the CMM®

52 goals

Collected into 18 Key Process Areas

Organized into 5 maturity levels

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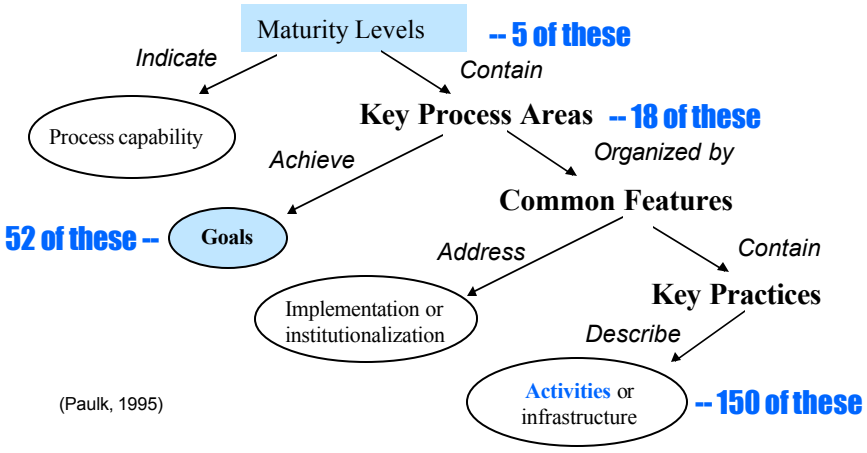
CMM® Structure



(Paulk, 1995)

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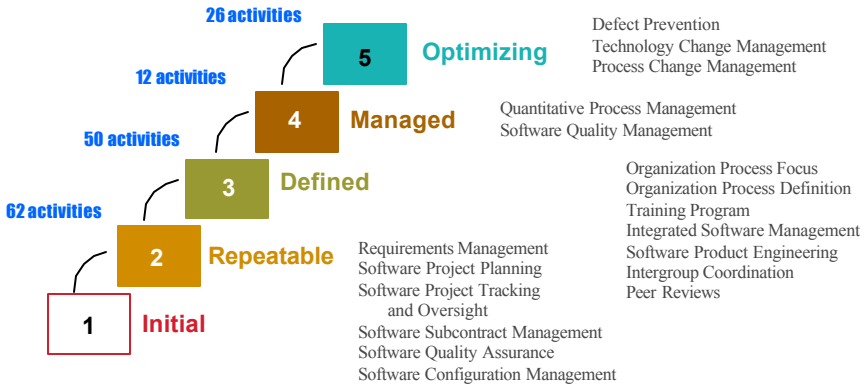
18 SW-CMM® (v1.1) Key Process Areas (KPAs) in 5 Maturity Levels



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CMM® Level 2 Goals

- **Requirements Management**
  - Control system requirements allocated to software to establish a baseline for software engineering and management
  - Keep plans, products, and activities consistent with the system requirements allocated to software
- **Software Project Planning**
  - Document software estimates
  - Plan and document project activities and commitments
  - Achieve agreement by affected groups and people to their commitments to the project
- **Software Project Tracking and Oversight**
  - Track actual results and performance against plans
  - Take corrective actions and manage them to closure when actual results and performance deviate significantly from project plans
  - Achieve agreement by affected groups and people to changes to project commitments

2
Repeatable

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CMM® Level 2 Goals (cont'd)

- **Software Subcontract Management**
  - Select qualified software subcontractors
  - Achieve agreement by prime contractor and software subcontractor to their commitments to each other
  - Maintain ongoing communications with software subcontractor
  - Track the software subcontractor's actual results and performance against its commitments
- **Software Quality Assurance (SQA)**
  - Plan SQA activities
  - Objective verification that software products and activities adhere to applicable standards, procedures, and requirements
  - Inform affected groups and people of SQA activities and results
  - Senior management addresses noncompliance issues that cannot be resolved within the project
- **Software Configuration Management (SCM)**
  - Plan SCM activities
  - Identify, control and make available selected software work products
  - Control changes to identified software work products
  - Inform affected groups and people of the status and content of software baselines.

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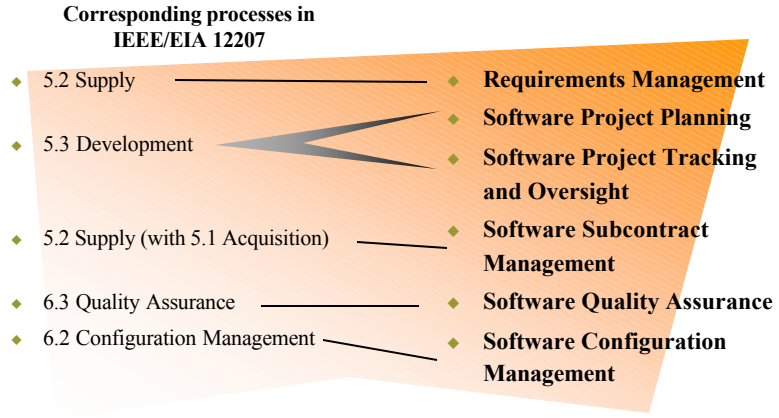
CMM® Level 2 Key Process Areas



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CMM® Level 3 Goals

3
Defined

- **Organization Process Focus**
  - Coordinate software process development and improvement activities across the organization
  - Relative to a process standard, identify the strengths and weaknesses of the software processes used
  - Plan organization-level process development and improvement activities
- **Organization Process Definition**
  - Develop and maintain a standard software process for the organization
  - Collect, review, and make available information related to the use of the organization's standard software process by software projects
- **Training Program**
  - Plan training activities
  - Provide training for developing the skills and knowledge needed to perform software management and technical roles
  - Put individuals in the software engineering group and software-related groups through the training necessary to perform their roles

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CMM® Level 3 Goals (cont'd)

- **Integrated Software Management**
  - Achieve a defined software process for a project that is a tailored version of the organization's standard software process
  - Plan and manage the project according to the project's defined software process
- **Software Product Engineering**
  - Define, integrate, and consistently perform the software engineering tasks to produce software
  - Keep software work products consistent with one another
- **Intergroup Coordination**
  - Achieve agreement by all affected parties to the customer's requirements
  - Achieve agreement by the affected groups to the commitments between engineering groups
  - Achieve identification, tracking, and resolution of intergroup issues by the engineering groups
- **Peer Reviews**
  - Plan peer review activities
  - Identify and remove defects in the software work products.

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CMM® Level 3 Key Process Areas

Corresponding processes in IEEE/EIA 12207

- 7.3 Improvement → **Organization Process Focus**
- 7.3 Improvement → **Organization Process Definition**
- 7.4 Training & 5.2 Supply → **Training Program**
- 5.3 Development & 7.3 Improvement → **Integrated Software Management**
- 5.3 Development → **Software Product Engineering**
- Best Fit: 5.2 Supply → **Intergroup Coordination**
- Best Fit: 6.4 Verification & 6.8 Problem Resolution → **Peer Reviews**

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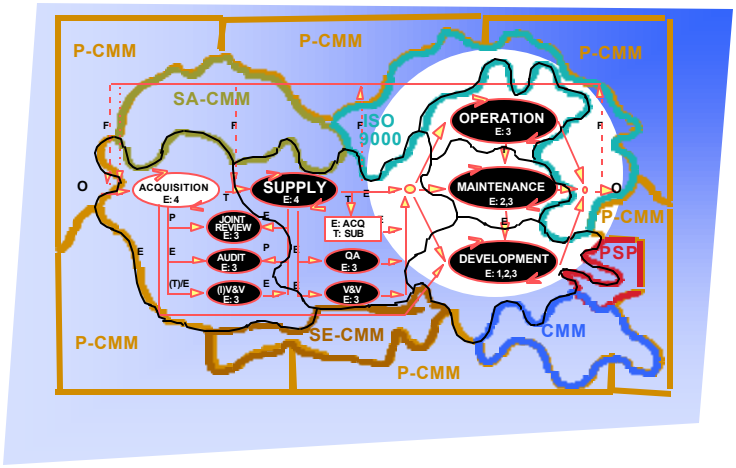
IEEE/EIA 12207 and ISO 9000



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Bottom Line on the ISO 9000 Series

30 requirements for a quality system

Published in 3 quality system standards.
Explained in 2 guidelines standards.

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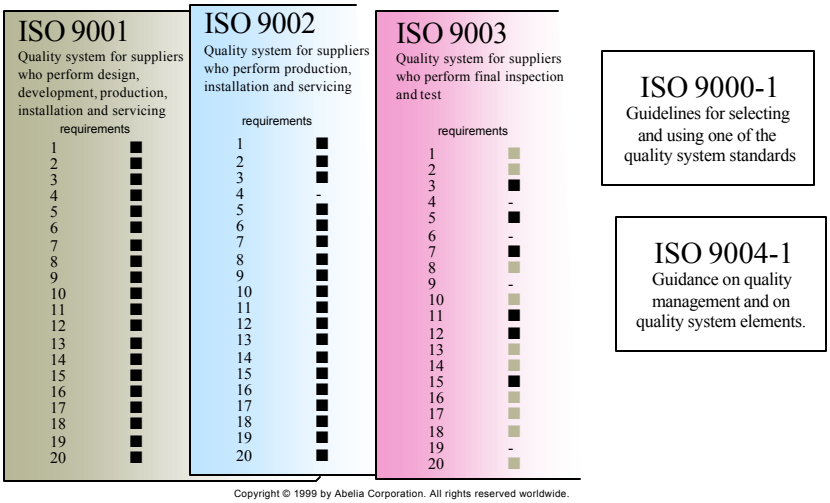
ISO 9000 Series Structure



ISO 9000-1
Guidance for selecting and using one of the quality system standards

ISO 9004-1
Guidance on quality management and on quality system elements.

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Quality System Requirements

- 1. Management Responsibility
- 2. Quality System
- 3. Contract Review
- 4. Design Control
- 5. Document and Data Control
- 6. Purchasing
- 7. Control of Customer-supplied Product
- 8. Product Identification and Traceability
- 9. Process Control
- 10. Inspection and Testing
- 11. Control of Inspection, Measuring, and Test Equipment
- 12. Inspection and Test Status
- 13. Control of Nonconforming Product
- 14. Corrective and Preventive Action
- 15. Handling, Storage, Packaging, Preservation, and Delivery
- 16. Control of Quality Records
- 17. Internal Quality Audits
- 18. Training
- 19. Servicing
- 20. Statistical Techniques

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IEEE/EIA 12207 Acquisition Process Activities

- **Initiation**
- **Request-for-Proposal [-tender] Preparation**
- **Contract Preparation and Update**
- **Supplier Monitoring**
- **Acceptance and Completion**

Corresponding clauses in ISO 9001
(See, "The TickIT Guide: A Guide to Software Quality Management System Construction and Certification to ISO 9001," Issue 4.0, (DISC TickIT Office: London, 12 Jan 98)

- 4.3 Contract Review
- 4.6 Purchasing
- 4.10 Inspection and Testing

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IEEE/EIA 12207
Supply Process Activities

- **Initiation**
- **Preparation of Response**
- **Contract**
- **Planning**
- **Execution and Control**
- **Review and Evaluation**
- **Delivery and Completion**

Corresponding clauses in ISO 9001
(See, "The TickIT Guide: A Guide to Software Quality Management System Construction and Certification to ISO 9001," Issue 4.0, (DISC TickIT Office: London, 12 Jan 98)

- 4.2 Quality System
- 4.3 Contract Review
- 4.4 Design Control
  - 4.4.1 General
  - 4.4.2 Design and development planning
  - 4.4.3 Organizational and technical interfaces
- 4.15 Handling, Storage, Packaging, Preservation, and Delivery

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(1) IEEE/EIA 12207
Development Process Activities

- **Process Implementation**
- System Requirements Analysis
- System Architectural Design
- Software Requirements Analysis
- Software Architectural Design
- Software Detailed Design
- Software Coding and Testing
- Software Integration
- Software Qualification Testing
- System Integration
- System Qualification Testing
- Software Installation
- Software Acceptance Support

Corresponding clauses in ISO 9001
(See, "The TickIT Guide: A Guide to Software Quality Management System Construction and Certification to ISO 9001," Issue 4.0, (DISC TickIT Office: London, 12 Jan 98)

- 4.2.3 Quality planning
- 4.4 Design Control
  - 4.4.1 General
- 4.9 Process Control

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(2) IEEE/EIA 12207 Development Process Activities

- Process Implementation
- **System Requirements Analysis**
- System Architectural Design
- **Software Requirements Analysis**
- Software Architectural Design
- Software Detailed Design
- Software Coding and Testing
- Software Integration
- Software Qualification Testing
- System Integration
- System Qualification Testing
- Software Installation
- Software Acceptance Support

Corresponding clauses in ISO 9001
(See, "The TickIT Guide: A Guide to Software Quality Management System Construction and Certification to ISO 9001," Issue 4.0, (DISC TickIT Office: London, 12 Jan 98)

- 4.4.4 Design input
- 4.4.7 Design verification
- 4.4.8 Design validation
- 4.8 Product Identification and Traceability
- 4.11 Control of Inspection, Measuring, and Test Equipment

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(3) IEEE/EIA 12207 Development Process Activities

- Process Implementation
- System Requirements Analysis
- **System Architectural Design**
- Software Requirements Analysis
- **Software Architectural Design**
- **Software Detailed Design**
- Software Coding and Testing
- Software Integration
- Software Qualification Testing
- System Integration
- System Qualification Testing
- Software Installation
- Software Acceptance Support

Corresponding clauses in ISO 9001
(See, "The TickIT Guide: A Guide to Software Quality Management System Construction and Certification to ISO 9001," Issue 4.0, (DISC TickIT Office: London, 12 Jan 98)

- 4.4 Design Control
  - 4.4.1 General
  - 4.4.5 Design output
  - 4.4.7 Design verification
  - 4.4.8 Design validation

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(4) IEEE/EIA 12207 Development Process Activities

- Process Implementation
- System Requirements Analysis
- System Architectural Design
- Software Requirements Analysis
- Software Architectural Design
- Software Detailed Design
- **Software Coding and Testing**
- **Software Integration**
- **Software Qualification Testing**
- **System Integration**
- **System Qualification Testing**
- Software Installation
- Software Acceptance Support

Corresponding clauses in ISO 9001
(See, "The TickIT Guide: A Guide to Software Quality Management System Construction and Certification to ISO 9001," Issue 4.0, (DISC TickIT Office: London, 12 Jan 98)

- 4.4 Design Control
  - 4.4.1 General
  - 4.4.5 Design output
  - 4.4.7 Design verification
  - 4.4.8 Design validation
- 4.8 Product Identification and Traceability
- 4.9 Process Control
- 4.10 Inspection and Testing
- 4.12 Inspection and Test Status
- 4.13 Control of Nonconforming Product
- 4.14 Corrective and Preventive Action
- 4.15 Handling, Storage, Packaging, Preservation, and Delivery

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(5) IEEE/EIA 12207 Development Process Activities

- Process Implementation
- System Requirements Analysis
- System Architectural Design
- Software Requirements Analysis
- Software Architectural Design
- Software Detailed Design
- Software Coding and Testing
- Software Integration
- Software Qualification Testing
- System Integration
- System Qualification Testing
- **Software Installation**
- **Software Acceptance Support**

Corresponding clauses in ISO 9001
(See, "The TickIT Guide: A Guide to Software Quality Management System Construction and Certification to ISO 9001," Issue 4.0, (DISC TickIT Office: London, 12 Jan 98)

- 4.9 Process Control
- 4.10 Inspection and Testing
- 4.12 Inspection and Test Status
- 4.13 Control of Nonconforming Product
- 4.14 Corrective and Preventive Action
- 4.15 Handling, Storage, Packaging, Preservation, and Delivery

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IEEE/EIA 12207
Operation Process Activities

- **Process Implementation**
- **Operational Testing**
- **System Operation**
- **User Support**

Corresponding clauses in ISO 9001
(See, "The TickIT Guide: A Guide to Software Quality Management System Construction and Certification to ISO 9001," Issue 4.0, (DISC TickIT Office: London, 12 Jan 98)

- 4.14 Corrective and Preventive Action
- 4.19 Servicing

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IEEE/EIA 12207
Maintenance Process Activities

- **Process Implementation**
- **Problem and Modification Analysis**
- **Modification Implementation**
- **Maintenance Review / Acceptance**
- **Migration**
- **Software Retirement**

Corresponding clauses in ISO 9001
(See, "The TickIT Guide: A Guide to Software Quality Management System Construction and Certification to ISO 9001," Issue 4.0, (DISC TickIT Office: London, 12 Jan 98)

- 4.4.9 Design changes
- 4.14 Corrective and Preventive Action
- 4.19 Servicing

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(1) IEEE/EIA 12207 Supporting Processes

- **Documentation**
- Configuration Management
- Quality Assurance
- Verification
- Validation
- Joint Review
- Audit
- Problem Resolution

Corresponding clauses in ISO 9001
(See, "The TickIT Guide: A Guide to Software Quality Management System Construction and Certification to ISO 9001," Issue 4.0, (DISC TickIT Office: London, 12 Jan 98)

- 4.5 Document and Data Control
- 4.7 Control of Customer-Supplied Product
- 4.8 Product Identification and Traceability
- 4.16 Control of Quality Records

------ Quality Record requirements -----

- 4.1.3 Management review
- 4.3 Contract Review
  - 4.4.6 Design review
  - 4.4.7 Design verification
  - 4.6.2 Evaluation of subcontractors
- 4.7 Control of Customer-Supplied Product
- 4.8 Product Identification and Traceability
- 4.9 Process Control
  - 4.10.2 Receiving inspection and testing
  - 4.10.5 Inspection and test records
- 4.11 Control of Inspection, Measuring, and Test Equipment
  - 4.11.2 Control procedure
  - 4.13.2 Review and disposition of nonconforming product
  - 4.14.2 Corrective action
- 4.17 Internal Quality Audits
- 4.18 Training

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(2) IEEE/EIA 12207 Supporting Processes

- Documentation
- **Configuration Management**
- **Quality Assurance**
- Verification
- Validation
- Joint Review
- Audit
- Problem Resolution

Corresponding clauses in ISO 9001
(See, "The TickIT Guide: A Guide to Software Quality Management System Construction and Certification to ISO 9001," Issue 4.0, (DISC TickIT Office: London, 12 Jan 98)

- 4.4.9 Design changes
- 4.8 Product Identification and Traceability
- 4.12 Inspection and Test Status
- 4.15 Handling, Storage, Packaging, Preservation, and Delivery

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- 4.1 Management Responsibility
- 4.2 Quality System
- 4.4 Design Review
- 4.9 Process Control
- 4.14 Corrective and Preventive Action
- 4.17 Internal Quality Audits

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(3) IEEE/EIA 12207 Supporting Processes

- Documentation
- Configuration Management
- Quality Assurance
- **Verification**
- **Validation**
- **Joint Review**
- **Audit**
- **Problem Resolution**

Corresponding clauses in ISO 9001
(See, "The TickIT Guide: A Guide to Software Quality Management System Construction and Certification to ISO 9001," Issue 4.0, (DISC TickIT Office: London, 12 Jan 98)

- 4.4.3 Organizational and technical interfaces
- 4.4.6 Design review
- 4.4.7 Design verification
- 4.4.8 Design validation
- 4.8 Product Identification and Traceability
- 4.17 Internal Quality Audits

- 4.13 Control of Nonconforming Product
- 4.14 Corrective and Preventive Action
- 4.17 Internal Quality Audits

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(1) IEEE/EIA 12207 Organizational Life Cycle Processes

- **Management**
- **Infrastructure**
- Improvement
- Training

Corresponding clauses in ISO 9001
(See, "The TickIT Guide: A Guide to Software Quality Management System Construction and Certification to ISO 9001," Issue 4.0, (DISC TickIT Office: London, 12 Jan 98)

- 4.1 Management Responsibility
  - 4.4.2 Design and development planning
- 4.9 Process Control
- 4.20 Statistical Techniques

- 4.9 Process Control
  - 4.10.2 Receiving, inspection,and testing
- 4.11 Control of Inspection, Measuring, and Test Equipment

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(2) IEEE/EIA 12207 Organizational Life Cycle Processes

- Management
- Infrastructure
- **Improvement**
- **Training**

Corresponding clauses in ISO 9001
(See, "The TickIT Guide: A Guide to Software Quality Management System Construction and Certification to ISO 9001," Issue 4.0, (DISC TickIT Office: London, 12 Jan 98)

- 4.1 Management Responsibility
  - 4.1.1 Quality policy
  - 4.1.3 Management review
- 4.2 Quality System
- 4.14 Corrective and Preventive Action
- 4.17 Internal Quality Audits
- 4.20 Statistical Techniques

  - 4.1.2.2 Resources
- 4.18 Training

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Topics

- Background
- Similarities and differences between requirements in
  - IEEE/EIA 12207
  - ISO 12207
  - J-STD-016
  - MIL-STD-498
- Comparing
  - IEEE/EIA 12207
  - J-STD-016
  - CMM®
  - ISO 9001
- **More**

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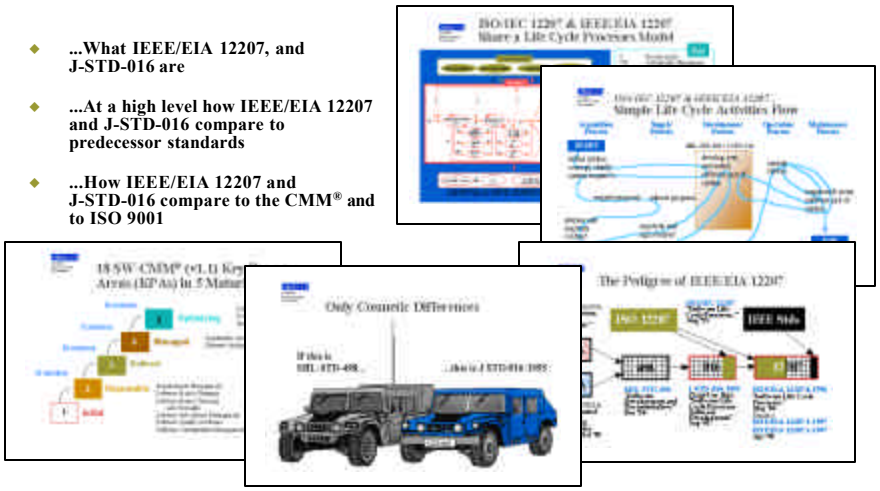
Objectives Tonight -- To Answer...

- **...What IEEE/EIA 12207, and J-STD-016 are**
- **...At a high level how IEEE/EIA 12207 and J-STD-016 compare to predecessor standards**
- **...How IEEE/EIA 12207 and J-STD-016 compare to the CMM® and to ISO 9001**



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How to Get IEEE/EIA 12207 and J-STD-016

IEEE/EIA 12207

- Order from IEEE at 800-678-4333 (732-981-0060 outside the US and Canada) -- FAX: 908-981-9667 -- telex 833233
- **US DoD customers: Obtain IEEE/EIA 12207 through the (DODSSP) Standardization Order Desk, 700 Robbins Avenue, Building 4/D, Philadelphia, PA 19111-5094.**

J-STD-016-1995

- Order from IEEE, or from Global Engineering Documents at 800-854-7179 (303-397-7956 outside the US) -- FAX: 303-397-2740.

MIL-STD-498

- Download from Abelia Corporation at http://www.abelia.com/pubsmain.htm

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Recommended Reading

- Reed Sorensen, "MIL-STD-498, J-STD-016, and the U.S. Commercial Standard," in ***CrossTalk***, June 1996, pages 13-14, 26.
- Lewis Gray, "ISO/IEC 12207 Software Life Cycle Processes," in ***CrossTalk***, August 1996, pages 14-18.
- Raghu Singh, "International Standard ISO/IEC 12207 Software Life Cycle Processes," August 1996 at www.abelia.com/pubsmain.htm
- James W. Moore, Perry R. DeWeese, and Dennis Rilling, "U.S. Software Lifecycle Process Standards," in ***CrossTalk***, July 1997, pages 6-8.
- Raghu Singh, "ISO/IEC 12207 Tutorial," June 1998 at www.abelia.com/pubsmain.htm